Amendments to the Specification:

Please replace paragraph [0008] with the following amended paragraph:

[0008] The present invention provides a full mesh optical ~~interconnects including backplanes and midplanes having redundant~~ backplane having power transmission conductors and a set of optical transmission guides for accommodating a set of circuit board assemblies forming part of an electronic system. Each circuit board assembly is provided with electrical power through ~~the redundant~~ power transmission conductors from a centralized source ~~such as the 48v battery subsystem provided by many central switching offices~~. The optical transmission guides enable direct transmission of data from each circuit board assembly within a system to any and all other circuit boards within the system.

Please replace paragraph [0010] with the following amended paragraph:

[0010] In specific embodiments [[of (n)]]a plurality of circuit board assemblies, ~~((n) times (n-1))~~and a plurality of optical transmission guides are required. For the simple case of one circuit board, no transmission guides are required. For two circuit board assemblies, two transmission guides are required: one to transmit from the first assembly to the second assembly, and one to transmit from the second assembly to the first assembly. For simplicity, ~~the equation describing~~ the number of transmission guides can be divided by two to account for the generalized requirement for bi-directional transmission. Thus for example, in a system comprising eight circuit board assemblies, ~~((8 times 7)/(2)) or~~ twenty-eight transmission guide pairs are required and each circuit board assembly would be connected to seven transmission guide pairs so that it could communicate directly with each of its circuit board neighbors.

Please replace paragraph [0011] with the following amended paragraph:

[0011] In a preferred embodiment of the invention, each circuit board assembly in the system has [[(n-1)]]a plurality of optical interfaces arranged along an edge of the circuit board, with each optical interface comprising both a transmitter and a receiver. In addition, each circuit board assembly in the system has a ~~redundant number~~plurality of electrical contacts along the same edge to obtain the required electrical power to perform its function. ~~Redundant~~A plurality of electrical contacts are provided to enhance the reliability of the power distribution means.

Please replace paragraph [0039] with the following amended paragraph:

[0039] Referring to FIG. 1 of the drawing, a full mesh optical interconnect according to the invention in the form of backplane [[I]]1 comprises in general assembly a stack of ~~number n, or in this case,~~ eight optical wave guide plates 2, electrical power distribution means including a [[more]]positive electrical power supply conductor 3 and a [[more]]negative power supply conductor 4, a cardguide 5 with guide slots 6, 7 and 8 for mounting a circuit board assembly 11 (FIG. 2), and optical waveguide ~~receiver~~receiving ports 9 and optical waveguide ~~transmitter~~transmitting ports 10 for registry with electro-optical interfaces 13 of FIG. 2. Power supply conductors 3 and 4 are provided for each cardguide 5 in preferred embodiment.

Please replace paragraph [0040] with the following amended paragraph:

[0040] In preferred embodiment, the waveguide plates are cylindrical discs stacked end to end to form a backplane cylinder. As shown in FIG. 1, there are [[n or]]eight sets of power distribution means and cardguides arranged symmetrically along the outer surface of the backplane cylinder and parallel to the backplane cylinder axis. Eight circuit boards are fitted to the cardguides with electro-optical interfaces 13 in optical registry with optical waveguide receiver ports 9 and optical waveguide transmitter ports 10 and with the circuit boards contacting the power distribution means. When so assembled, the circuit boards project radially from the backplane cylinder and those skilled in the art will recognize that a supporting frame (not shown) may easily be constructed about this circuit board assembly. The waveguide plates 2 in the stack are more particularly identified by letters a', b', c', d', e', f', g', and h'. The circuit board assembly card guides 5 are identified by letters a, b, c, d, e, f, g, and h. Letters a through h also identify the location of eight fixed stations equally spaced about the circumference of the optical backplane stack.

Please replace paragraph [0041] with the following amended paragraph:

[0041] A circuit board assembly 11 designed for operation with the present invention is illustrated in FIG. 2 wherein the circuit board comprises [[(n-1) or]]seven electro-optical interfaces 13 in optical registry with optical waveguide receiver ports 9 and optical waveguide transmitter ports 10, and alignment tabs 12 to mate with cardguide slots 6, 7, and 8. The illustrated circuit board assembly is shown as it would be used in circuit board cardguide station a. The electro-optical interfaces 13 are marked letters a', b'and d'-h' to indicate registry with plates a', b' and d'-h' of the backplane. Those skilled in the art will recognize that additional surface area is required on the circuit board assembly 11 to provide space for active circuitry and that multiple ~~redundant~~ power contacts can be placed along the edge 11a containing the electro-optical interfaces 13 to provide for reliable power distribution.

Please replace paragraph [0044] with the following amended paragraph:

[0044] FIGS. 4 and 5 respectively illustrate first and second types of waveguide plates. The waveguide plate 16 of FIG. 4 is an opaque optical body 19 with three pairs 20 of optically transparent side-by-side waveguides, with each waveguide pair comprising a ~~receiver~~receiving waveguide 9 in optical registry with electro-optical interface 13 ~~receiver~~receiving port 9a (FIG. 7) and a ~~transmit~~transmitting waveguide 10 in optical registry with electro-optical interface 13 ~~transmit~~transmitting port 10a. The optically opaque body at 19a (FIG. 6) also extends between the side-by-side ~~transmit~~transmitting waveguide 10 and the

~~receive~~receiving waveguide 9 so that the two waveguide members of the pair are optically isolated from each other. FIG. 6 shows a cross section of the waveguide plate of FIG. 4 with the ~~transmit~~transmitting waveguide 10 and the ~~receive~~receiving waveguide shown to extend only partially into the optically opaque body 19. The diminutive sizes of the ~~transmit~~transmitting 10 and ~~receive~~receiving 9 waveguides is intended to maximize the density of the optical flux within each waveguide.

Please replace paragraph [0045] with the following amended paragraph:

[0045] FIG. 7 of the drawing illustrates the mating surfaces for the ~~tran~~smit~~transmitting~~ 10 and ~~receive~~receiving 9 waveguides. Recesses are formed to provide positive locating means for the electro-optical interface 13. These mating structures also allow for the abutment of another set of waveguides that may extend the optical path directly onto the circuit board assembly 11. A dividing wall 24 prevents light from the ~~transmit~~transmitting waveguide 10 from entering the ~~receive~~receiving waveguide 9.

Please replace paragraph [0046] with the following amended paragraph:

[0046] The second type of waveguide plate 17 is shown in FIG. 5 in which four pairs of optical waveguides are provided. Each pair of optical waveguides comprises both a ~~transmit~~transmitting waveguide 10 and a ~~receive~~receiving 9 waveguide in side-by-side relationship and optically isolated from each other along their entire lengths, and optically isolated from each other at waveguide ports 9a and 10a at the perimeter P of the plate 17.

Please replace paragraph [0060] with the following amended paragraph:

[0060] In FIG. 12, the circular and rectangular sections of the midplane are connected simply by abutting some interconnecting waveguides between the two otherwise independent sections. The pairs of rectilinear 47 and circular 57 waveguide plates referred to specifically as plate or layer a' through layer d', and as layer e' through h'. The waveguide plates 47 and 57 contain the ~~requisite n-1~~ waveguide pairs for each of [[n]] eight circuit board assemblies with this midplane illustrative embodiment having eight circuit board assemblies. Each wave guide plate 47 and 57 in FIG. 12 is circumscribed with cardguide or station letters 1 through 8 to indicate particular cardguide stations with respect to each plate and cardguide stations with respect to each transmit/receive waveguide pair, with a corresponding number [[(n-1)]] of optically isolated ~~transmit~~transmitting and ~~receive~~receiving waveguide paths. It will be further observed in FIG. 12 that waveguide plates a'-d' and e'-h' are stacked with respect to each other and present circular and rectilinear surfaces for receiving circuit board assemblies.

Please replace paragraph [0063] with the following amended paragraph:

[0063] The present invention lends itself very well to the notions of redundancy and fault tolerance. Since it is contemplated that the waveguide plates or layers are relatively thin, the height of an optical interconnect for a given number of circuit board assemblies would be rather small. Consequently, a [[fully]] redundant backplane can easily be made to fit in most systems so that an additional set of communications paths is

always readily available should a component associated with one or more of those in use fail. Alternatively, the additional communications paths can be used to handle any additional bandwidth should a given system require it. This additional bandwidth may come from the mere addition of communications paths or it may come from the construction of a logical bus or wide data path between circuit board assemblies. An additional capability provided by such simple scaleability is that in some systems it is desirable to provide separation of the transmitter and the receive circuitry for ease of circuit board assembly layout and to minimize any interference that high power transmitters may introduce into high sensitivity receivers.

Please replace paragraph [0064] with the following amended paragraph:

[0064] The waveguide plates 16, 17, 27, 37, 47 and 57 are described in detail above for ~~transmit and receive~~ transmitting and receiving optical signals in the optically isolated side-by-side waveguide paths. It is to be understood the the side-by-side waveguide paths are capable of conducting ~~transmit and transmit~~transmitting and transmitting optical signals as well as ~~receive and receive~~receiving and receiving optical signals.